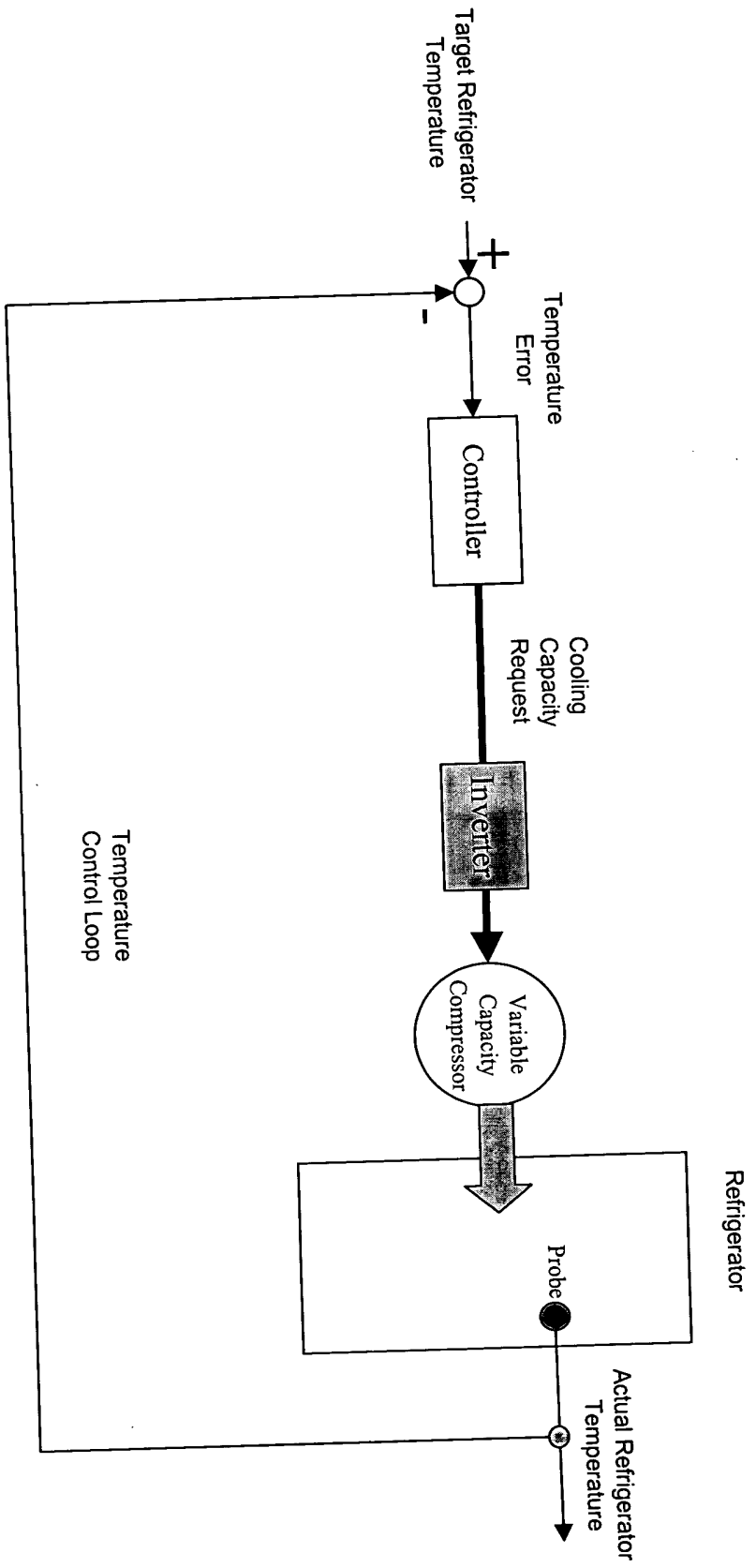

Figure 1 (Prior art)

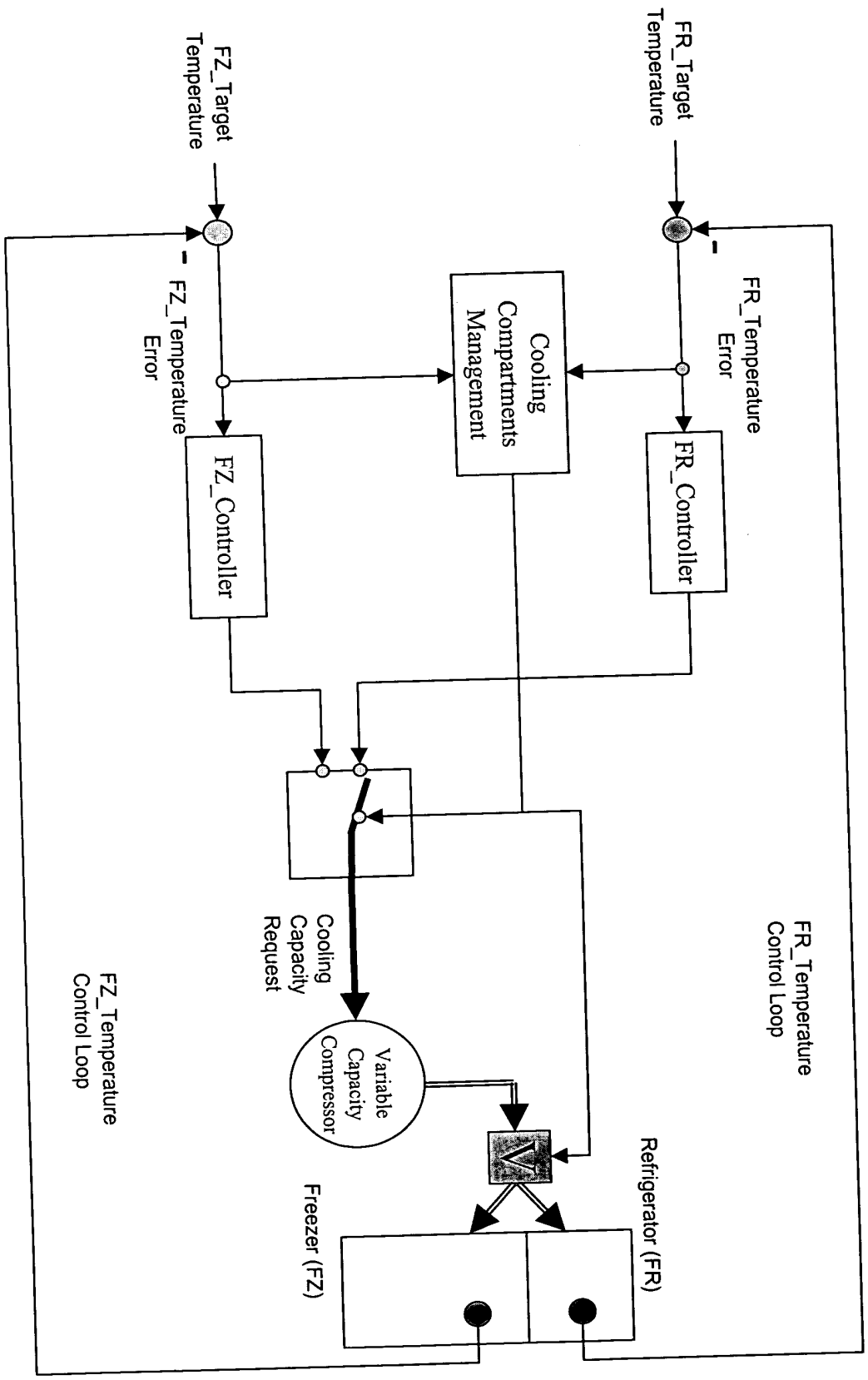
FR_Target Temperature
FZ_Target Temperature
FR_Temperature Error
FZ_Temperature Error
Cooling Compartments Management
FR_Controller
FZ_Controller
Cooling Capacity Request
Variable Capacity Compressor
V
Refrigerator (FR)
Freezer (FZ)
FR_Temperature Control Loop
FZ_Temperature Control Loop

Figure 2

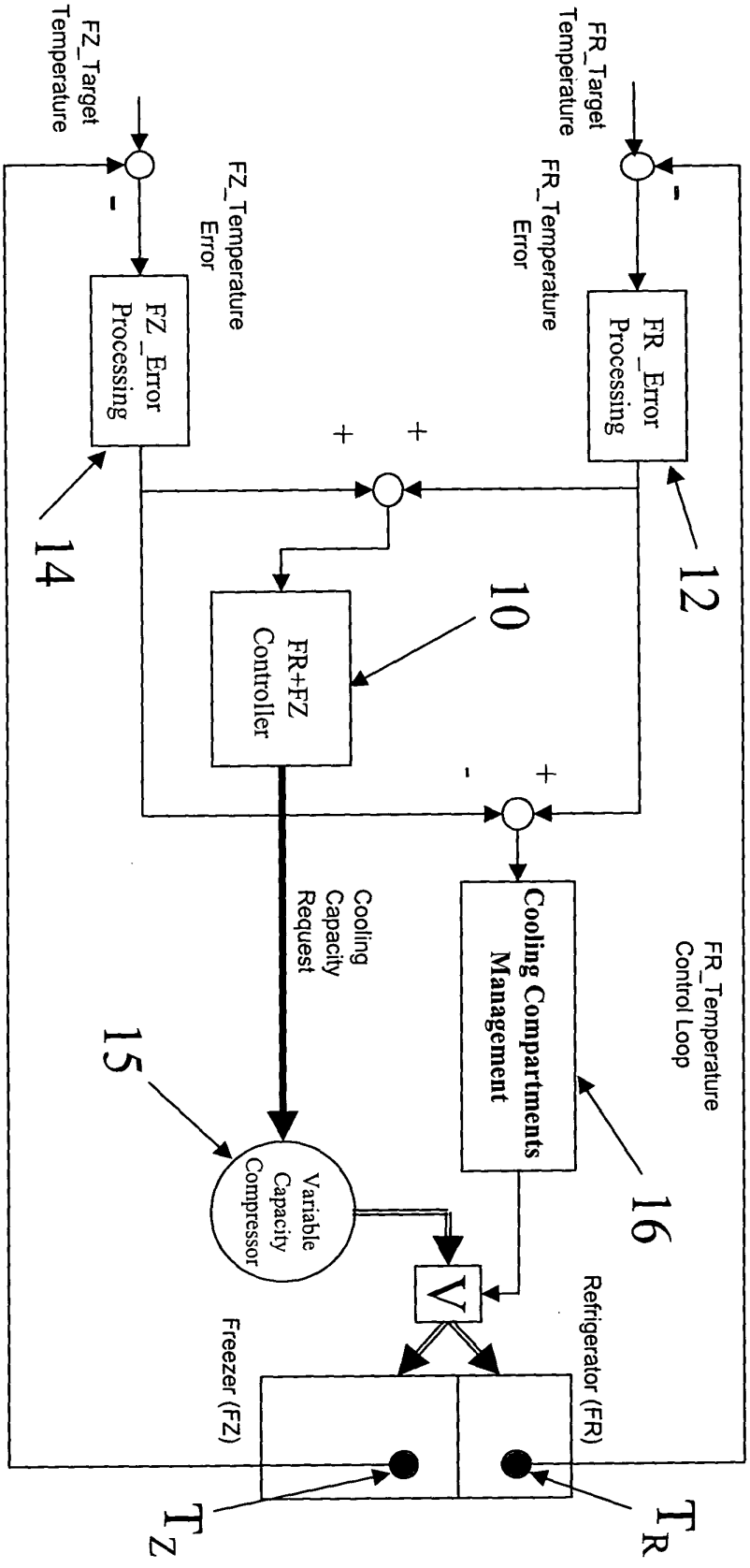
FR_Target Temperature
FR_Temperature Error
FR _Error Processing
FZ_Target Temperature
FZ_Temperature Error
FZ _Error Processing
12
14
10
FR+FZ Controller
Cooling Capacity Request
Cooling Compartments Management
16
15
Variable Capacity Compressor
V
Refrigerator (FR)
Freezer (FZ)
T_R
T_Z
FR_Temperature Control Loop
FZ_Temperature Control Loop
LR
LZ

Figure 3

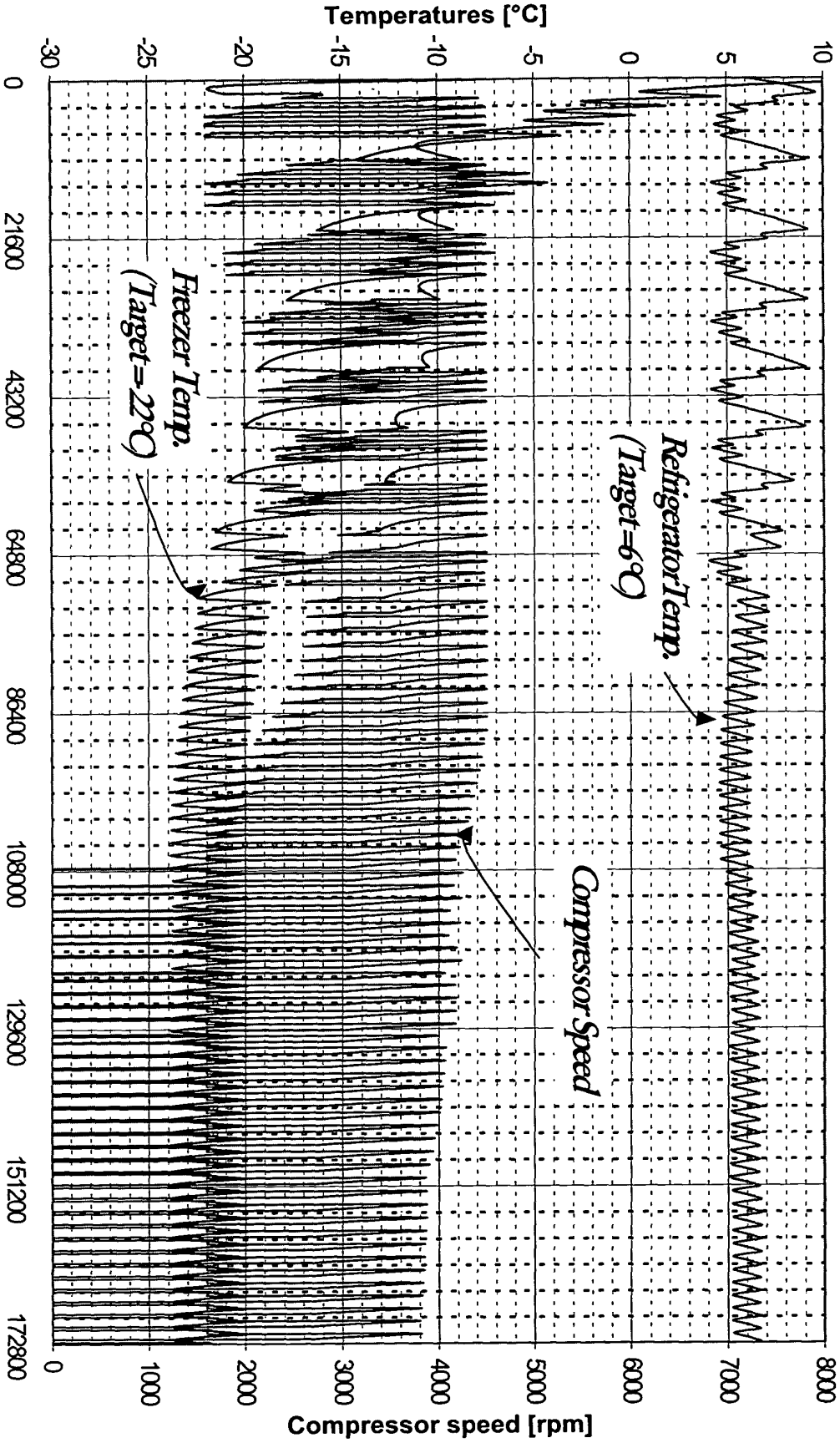
Indipendent controls
Temperatures [°C]
10
5
0
-5
-10
-15
-20
-25
-30
Refrigerator Temp.
(Target=6°C)
Freezer Temp.
(Target=-22°C)
Compressor Speed
8000
7000
6000
5000
4000
3000
2000
1000
0
Compressor speed [rpm]
0
21600
43200
64800
86400
108000
129600
151200
172800
Time [sec.]

Figure 4

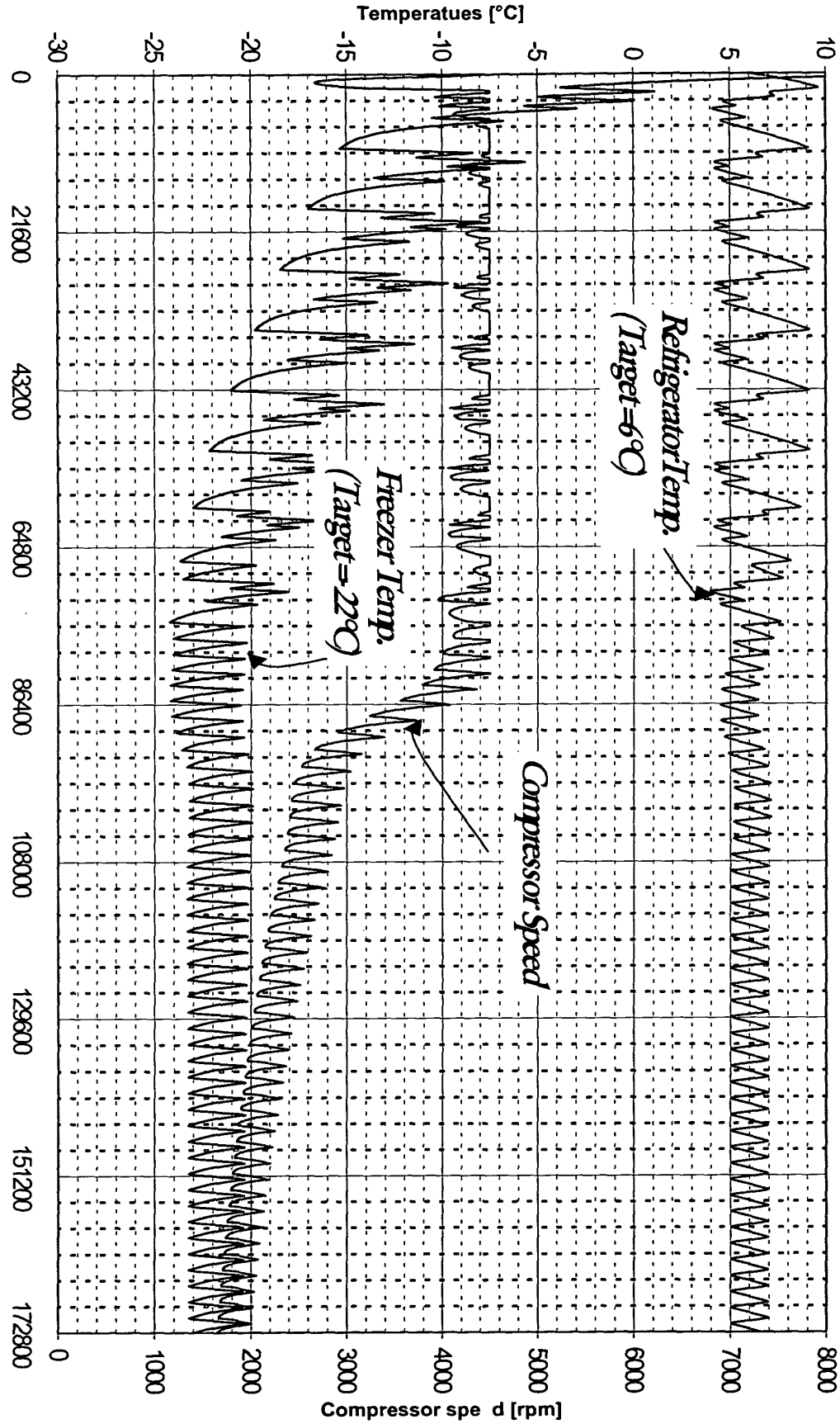
Temperatues [°C]
10
5
0
-5
-10
-15
-20
-25
-30
Refrigerator Temp.
(Target=6°C)
Freezer Temp.
(Target=-22°C)
Compressor Speed
Error Sum
Compressor spe d [rpm]
8000
7000
6000
5000
4000
3000
2000
1000
0
Time [sec.]
0
21600
43200
64800
86400
108000
129600
151200
172800

Figure 5

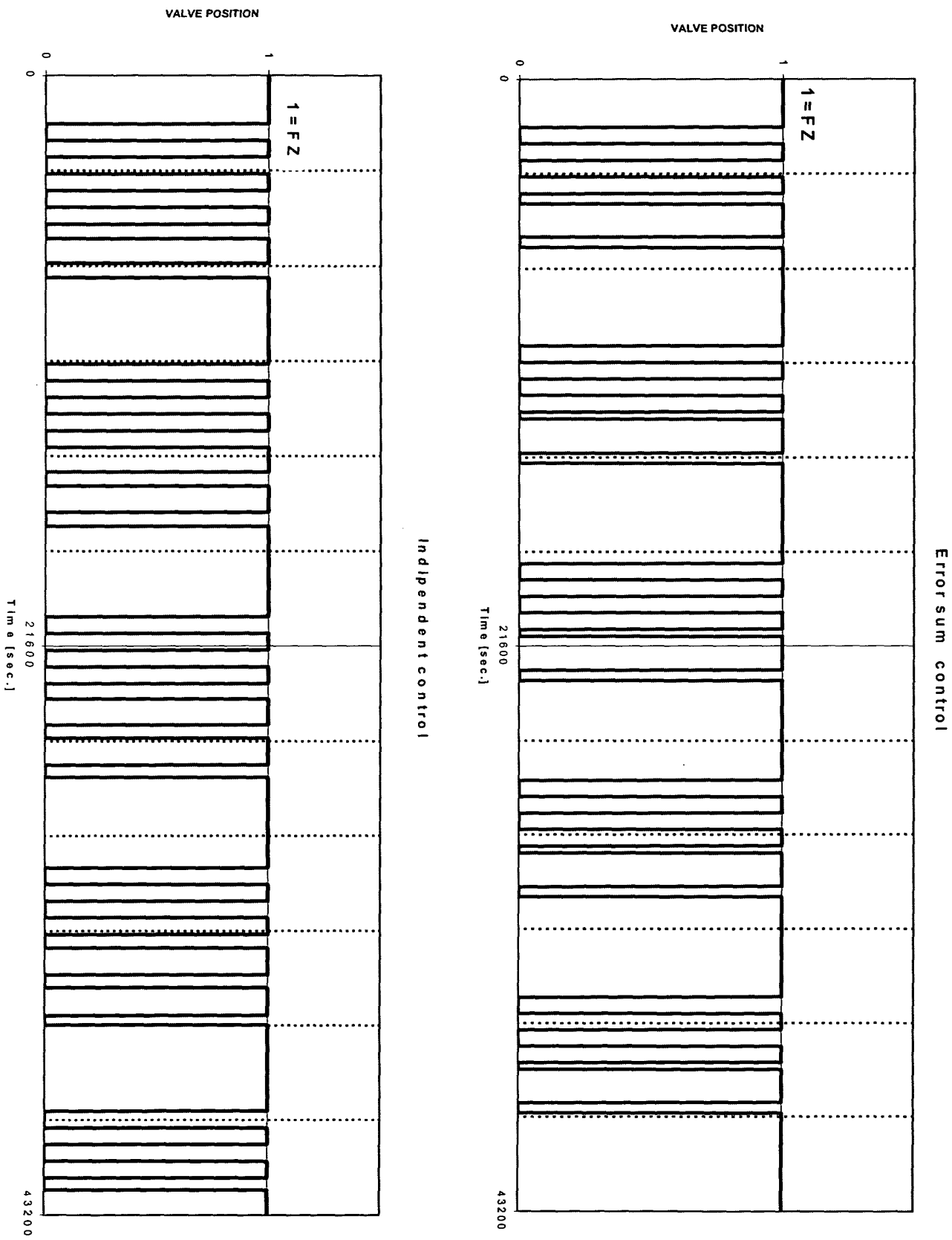
VALVE POSITION
0
1
0
1=FZ
21600
Time [sec.]
43200
Independent control
VALVE POSITION
0
1
0
1=FZ
21600
Time [sec.]
43200
Error sum control

Figure 6

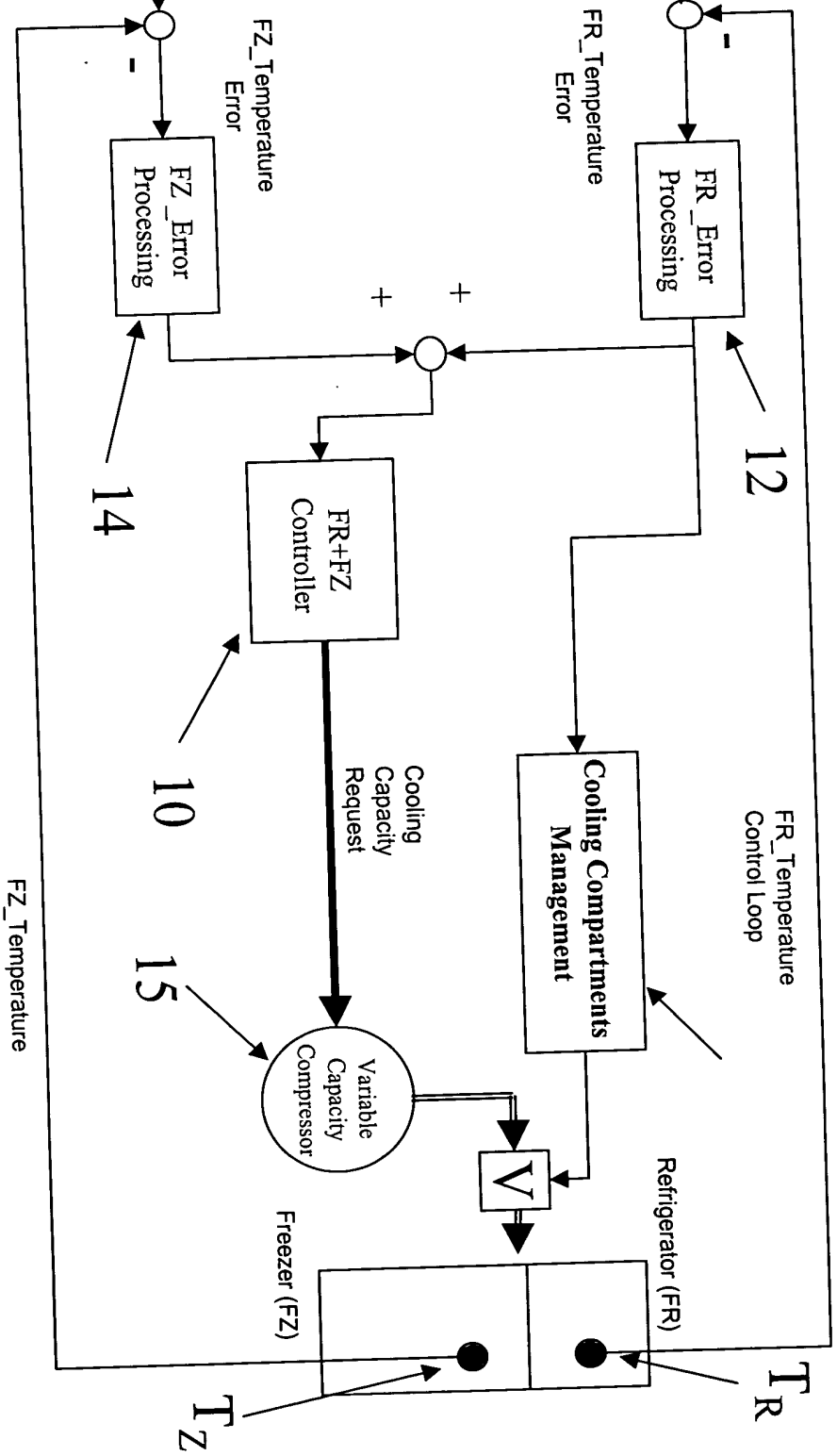
FR_Target Temperature
FR_Temperature Error
FR_Error Processing
FZ_Target Temperature
FZ_Temperature Error
FZ_Error Processing
12
14
FR+FZ Controller
10
Cooling Capacity Request
15
Variable Capacity Compressor
Cooling Compartments Management
V
FR_Temperature Control Loop
FZ_Temperature Control Loop
Refrigerator (FR)
Freezer (FZ)
T_R
T_Z

Figure 7

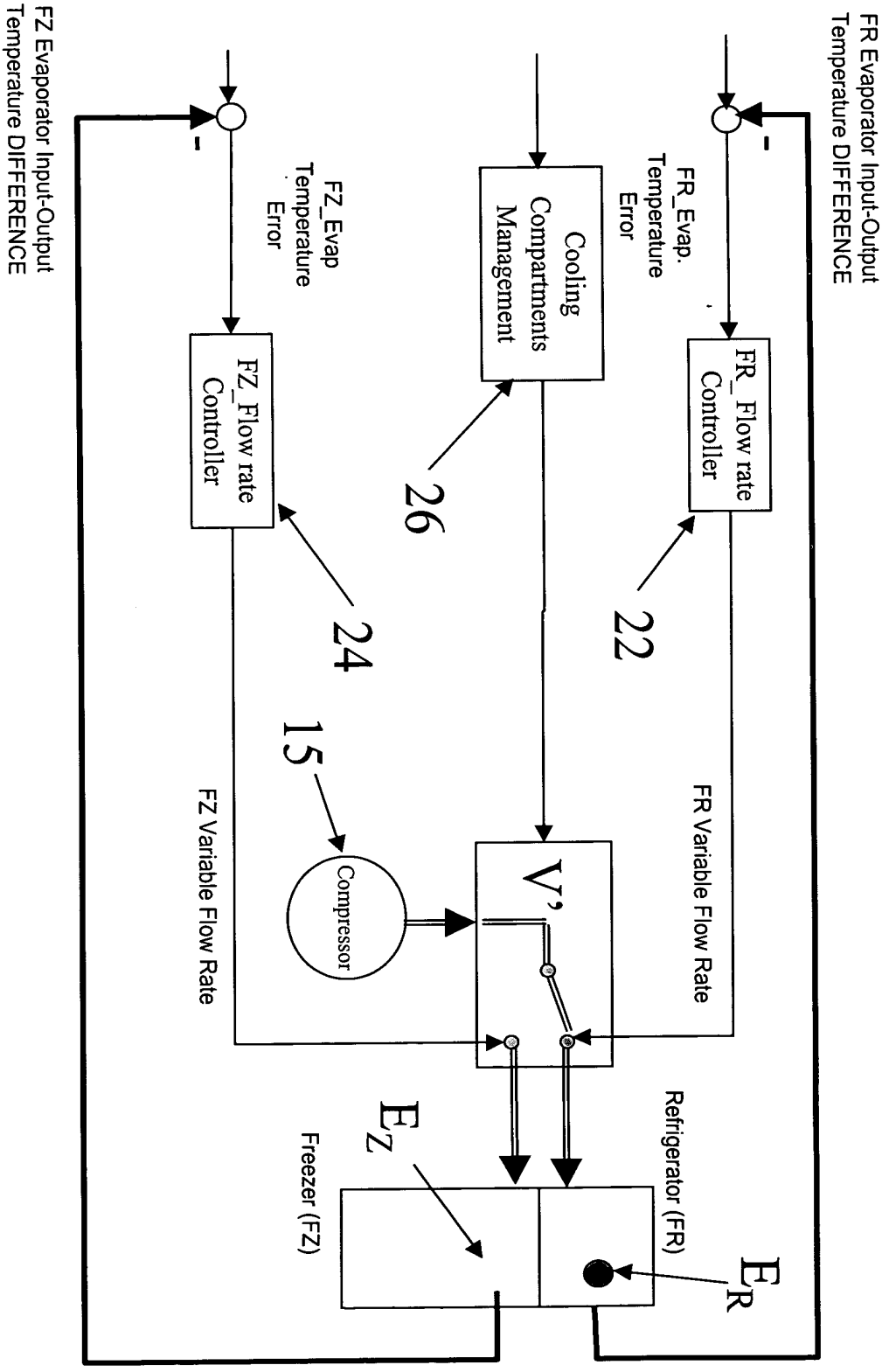
FR Evaporator Input-Output Temperature DIFFERENCE
FR_ Flow rate Controller
FR_Evap. Temperature Error
Cooling Compartments Management
FZ_Evap Temperature Error
FZ_ Flow rate Controller
FZ Evaporator Input-Output Temperature DIFFERENCE
FR Variable Flow Rate
FZ Variable Flow Rate
Compressor
V'
Refrigerator (FR)
Freezer (FZ)
E_R
E_Z
22
24
26
15

Figure 8